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West Virginia University
Agricultural Experiment Station
MORGANTOWN, W. VA.

DEPARTMENT OF HORTICULTURE

The Rejuvenation of Old Orchards.

By
W. H. ALDERMAN.

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BULLETIN 141

The Rejuvenation of Old Orchards

W. H. Alderman.

INTRODUCTION.

In West Virginia there are according to the last census 4,570,948 apple trees of bearing age grown on 76,122 farms, making an average of 60 trees per farm. The value of the crop in 1909 was $2,461,074 or an average of $32 per farm, or about fifty-four cents per tree. When we consider that some of the best commercial orchards yield an income of $5.00 and over per tree, we know that a great many of the orchards of the State must yield practically nothing to bring the average so low. A conservative estimate made by several people conversant with local conditions, places only one-half the bearing trees in West Virginia as yielding profitable crops. The other half, due to neglect, to the ravages of insects and disease, to poor locations, to ignorance or indifference on the part of the owner, are not paying for the use of the ground upon which they stand.

"How can I bring my old orchard into bearing?" is the question often asked. Before answering this question, let us see why the old orchard is not already bearing. Let us first diagnose the case and then suggest the remedy.

Causes Leading to the Decadence of Old Orchards.

Lack of Spraying. Failure to spray the trees, thereby allowing the various insects and diseases to ravage the orchards without restraint, has been one of the most common causes of unproductive orchards. The San Jose Scale is one pest present in practically every section of the State, and freedom from its attacks is purchased only at the cost of eternal vigilance and intelligent spraying.

Improper Pruning. Careless, injudicious or ignorant pruning has ruined many an otherwise promising West Virginia orchard.

Failure to properly form the head of the young tree has caused bearing trees to split assunder under stress of storm or load of fruit. Failure to observe the first principles of proper pruning (to cut the limb close up to the main stock and leave no stubs) has admitted the germs of decay to the heart wood of the tree and hastened a decrepit old age. Pruning enough in one season to last for the next five years has thrown the tree off its balance and set it to producing water sprouts and brush instead of fruit. Failure to prune at all has produced a "back to nature" condition in some orchards that can be compared only to a hawthorn thicket or a brushy hedge.

Starvation. The ambition to make two blades of grass grow where only one grew before is laudable, but to expect apples to grow in neglected thickets of Spanish needles, Beggars' Lice, Yellow Locust and Sassafras is the height of folly. A thrifty growing orchard must be given unrestricted use of all the land upon which it stands if profitable crops are to be expected. Whenever we see a tree making an inch or two of growth per year, the foliage yellow and dropping early in the fall the conclusion is at once reached that the orchard is being robbed of its proper nourishment. Even a sod of blue grass will rob the tree of its rightful amount of water and food.

Poor Location. Improper location on low grounds, in frost pockets, in shut-in coves where the air drainage and circulation are poor and the fogs hang until late in the day, are serious drawbacks to any orchard.

Lack of Drainage. Poorly drained soils will not produce profitable orchards. "Wet feet" are the forerunners of sickness, disease and death, whether the subject be orchards or mankind. Merely because the location is upon a slope is not necessarily proof that the soil is well drained. Hard impervious ridges or out crops of rock may dam up the flow of the ground water and produce a greater or lesser area of cold, sour, poorly aerated soil in which no fruit tree will thrive.

Old Age. The age limits of an orchard are indefinite and with the apple, vary in different parts of the country and under different treatment from 30 to 100 years. Old age is purely a relative term in any case. Mr. Brown's orchard may be old at twenty-five while his neighbor's is young at forty.

Any one, or as is more generally the case, all the above mentioned

causes may be directly concerned in the orchard's downfall. With the exception of two, old age and poor location, all may be remedied and the orchard saved if its condition is still good enough to justify the expense.

Is the Orchard Worth Rejunevating? This question should first be answered before any outlay of money is made. Many among the thousands of old orchards are not worth working with, and the sooner they reach the woodpile and the land used to better purpose, the better off will be the owner. Figure 1 shows a part of such an orchard. Atrociously pruned or rather butchered with an axe, never sprayed, never fertilized, sixty years of age, lower limbs twenty-five feet from the ground, weakened by decay, ravished by disease and infested with dangerous insects, it stands a monument to neglect, too worthless to be reclaimed, a menace to its neighbors

Fig. 1.—"Atrociously pruned—never sprayed, never fertilized, sixty years of age, lower limbs twenty-five feet from the ground—it is too worthless to be reclaimed."

and a disgrace to the fruit growers of West Virginia. In another orchard (fig. 8) the trees have only suffered by neglect without

undergoing the additional hardship of enthusiastic but misguided pruning. In this case the trees are still healthy and although they contain considerable dead wood and are making a very poor growth, may be brought back into vigorous production by careful management. One point that should be considered before restoring an orchard is the varieties it contains. In some of the old home orchards, the number of worthless commercial varieties is so great that it would not pay to rejuvenate the orchard.

Method of Procedure.

THINNING THE TREES. The first step in the restoration of an orchard is to thin out the number of trees it they stand too thick. If the branches interlace and the lower limbs are dying it is an indication that the orchard is too closely planted and would be benefitted by the removal of part of the trees. One should first make a rough map or plat of the orchard (fig. 2) showing the missing, weak or undersized trees, and then the thinning should be

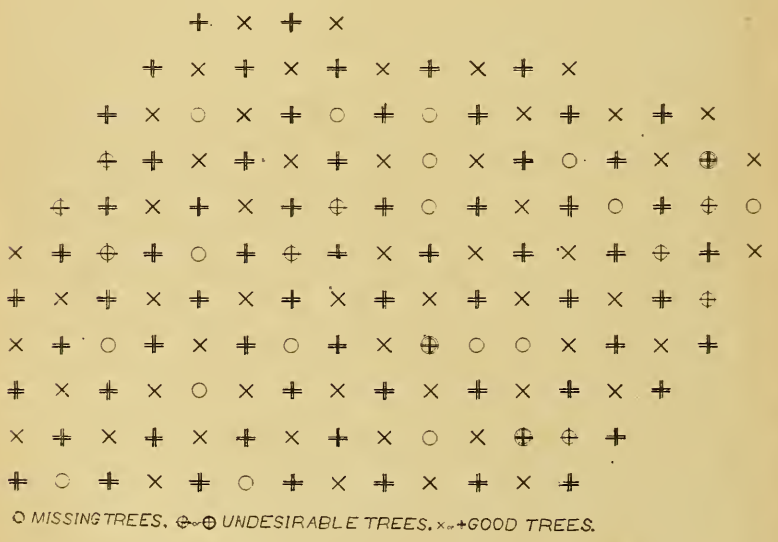

FIG. 2.—Thinning an orchard, so as to take out as many undesirable or missing trees as possible. The double lined trees are allowed to remain.

arranged so that as many as possible of these trees will be removed. Trees number 2, 4, 6, 8, etc., in the first row and number 1, 3, 5, 7, etc., in the second row should be taken out, or stated in another

way, every alternate diagonal row should be removed. This will remove half the trees.

Pruning. After all the superfluous trees have been removed the remainder should be carefully pruned. The winter is the best, as well as the most convenient time for this work. All the dead and diseased wood should be first removed, followed by other limbs that cross or run parallel with each other, and all long and ungainly branches should be headed back to make the tree symmetrical. In many cases this will be pruning enough for the first season. Where the tree is over twenty-five feet in height, it is best to head back the top to bring the bearing surface nearer the ground.

In remodeling the trees it usually pays to make haste slowly for while severe pruning stimulates growth, overdoing the matter will start a rank growth of watersprouts and may interfere with the production of the fruit buds. With a healthy tree it is usually better to extend the pruning over two years instead of doing it all at once, but with a very weak tree it is safe and advisable to cut out all that is necessary the first season, in order to produce as great a growth as possible.

The one all important fact to remember in pruning is that if

Fig. 3.—If a stub is left, death and decay that reaches into the heart-wood soon follow.

a wound is to heal over, it must be supplied with food from the downward flow of sap returning from the leaves, the digestive organs of the plant. If a stub is left where a limb is removed, the wound can receive no nourishment for the sap ceases to circulate through the stub. Death and decay that reaches into the heart-wood soon follow. (Fig. 3). On the other hand a limb cut off close to the main branch leaves a wound directly in the path of the decending stream of plant food; new growth begins to spread over the cut and in a year or two the surface is completely covered. When limbs more than two inches in diameter are removed, it is advisable to paint the cut with a heavy lead paint to keep out the moisture.

Spraying. After the tree is pruned the matter of spraying should be considered. Whenever San Jose Scale is present, it is absolutely necessary to apply a dormant spray. Either of two materials may be used to control the scale, lime-sulphur solution or a soluble oil. Commercial lime-sulphur solution used at the rate of one gallon to eight of water, is to be preferred because of its fungicidal properties. In fact whether the San Jose scale is present or not, it pays to apply this dormant spray because it cleans off the moss, lichens and fungi that usually cling to neglected trees. *It must never be applied at this strength after the leaves come out.*

The subsequent sprayings should number at least two or more if necessary. The first of these should be applied as soon as the blossoms drop. Either lime-sulphur solution diluted 1 to 40, or Bordeaux Mixture (3 lbs. blue vitriol, 5 lbs. unslaked lime, and 50 gals. of water) may be used but the first named solution is now more generally coming into favor. In either case two and one half pounds of arsenate of lead should be added to a barrel of the liquid to act as a poison for the Codling Moth. This spray should be applied with considerable pressure to drive it well into the blossom end of the small apple. The second summer spray should be applied about three weeks after the last and consists of exactly the same materials. Unless these three sprays are religiously applied little profit or satisfaction need be expected from the orchard. It is usually advisable to spray a fourth time during July to catch the second brood of Codling Moth, although if the earlier sprayings have been thorough, the necessity for this last application is lessened. Special diseases as Bitter Rot, Cedar Rust and others require special treatments, the details of which cannot be given here.

Soil Improvement. Coincident with the care of the trees should come the improvement of the soil. If the orchard is not too steep, the soil should be plowed, running the plow as shallowly as possible so as not to break too many of the large roots which in an uncultivated orchard always lie near the surface. After the plow should come the harrow, working the surface into a fine friable condition. This cultivation should be repeated after each heavy rain to break the crust that would form. In this manner the soil moisture is conserved, for the fine dust mulch formed prevents its evaporation. This clean cultivation should continue until about August 1st when a cover crop of clover, cow-peas, soy beans, or even rye, should be planted to check the growth of the trees, ripen up wood, buds and fruit and form a cover for the bare ground during the winter. The following spring the crop is plowed under and forms a valuable source of plant food, particularly if it is one of the clovers, beans or peas. The mere act of cultivation also liberates plant food heretofore locked up in the soil.

If the land is too steep to allow of cultivation with safety, the next thing is to cover the soil with a mulch of barnyard manure, straw or other litter. This prevents the loss of moisture and provides nourishment as well, but is more expensive than cultivation. On some soils, deep, rich and well watered, the normal growth from the sod if cut twice during the season and allowed to lie on the ground, will furnish mulch enough.

Fertilizers. Most neglected orchards will respond to the liberal use of manure or commerical fertilizers for the first few years until they regain their health and vigor. If manure is used, from ten to fifteen tons is a fair application per acre. This should not be piled about the base of the tree where there are no feeding roots, but it should be spread evenly over the whole surface of the ground. If commerical fertilizer is used, it should be of some high grade goods like a 3-10-8 (3% nitrogen, 10% phosphoric acid, and 8 per cent potash.) This should be used at the rate of 300 to 500 pounds per acre. Better yet would it be to buy the separate chemicals and apply a home mixed product. In this case one should mix together for an acre 80 pounds of Nitrate of Soda, 250 pounds of Acid Phosphate and 70 pounds of Muriate or Sulphate of Potash. The fertilizer should be applied as soon after the leaves unfold in the spring as possible.

Top Working. It frequently happens that several trees in the

orchard will be undesirable varieties. These may be top-worked into some profitable sort, if the trees are in a healthy condition. Figure 4 shows the method of making a cleft or wedge graft, such as is commonly used in grafting large limbs. The cion wood, which consists of last year's growth, should be cut during March, before the buds have begun to swell, wrapped in damp burlap and stored in a cellar where it will remain dormant. It is important that the cion wood be hard and well matured with the buds well ripened. Just about the time growth starts in the spring is the proper time

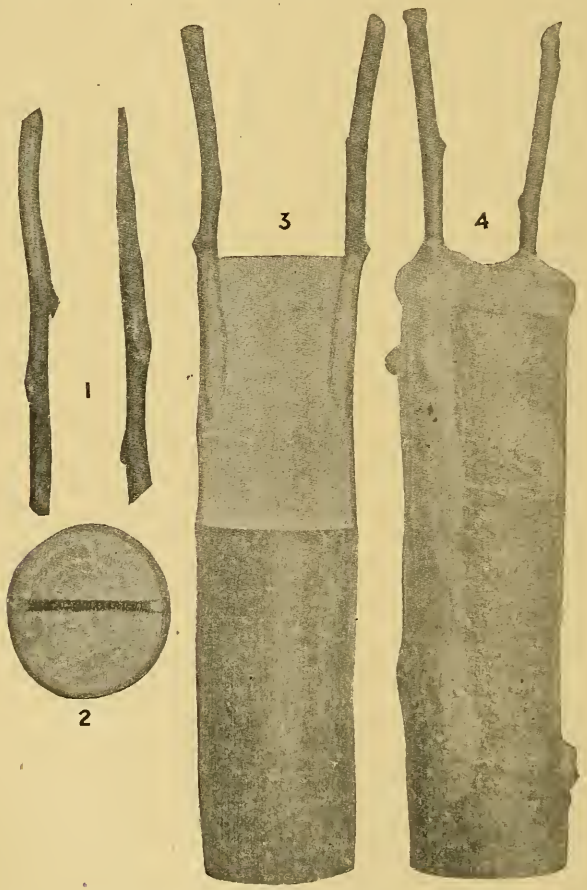

FIG. 4.—Cleft Grafting. 1, Cions prepared ready to set; 2, Cross-section of grafted stub showing inner bark of cion and stock meeting; 3, Cions in proper position (one-half stock cut away); 4, A completed cleft graft showing proper waxing. (*Courtesy of N. Y. Agr. Exp. Sta., Geneva, N. Y.*)

to do the grafting. It is not advisable to try and graft limbs over three inches in diameter. The grafts should be set back as near the center and trunk of the tree as possible, in order to keep the new head low and compact. Only those limbs that are to be grafted should be cut off, leaving the others to form the top during the first season before the cions have grown out.

The first step in cleft grafting is to saw off the limb and carefully split the stub, taking care that the split does not encounter a knot but runs straight down the sides of the limb. The cleft should be spread by means of a wedge and it is ready to receive the cions. These should be cut from near the middle of the cion stick, for there the buds are most vigorous. Beginning on either side of the bud, cut the lower end of the cion in the form of a wedge, the edge on the opposite side from the bud being slightly the narrower. About three buds should be left on the cion which should be inserted into the cleft, with its narrower side towards the center of the stock. This allows the thicker portion of the wedge to be gripped firmly by the limb. The greatest care should be taken to see that the inner bark of stock and cion come in contact with each other at one or more places. By setting the cion at a slight angle, this contact is insured. After placing two cions the wedge should be removed and the entire cut surface including the tips of the cions and the cracks along the sides of the limb should be covered with grafting wax. If both cions start, one should be removed after the first season's growth.

THE RECORD OF SIX REJUVENATED ORCHARDS.

In 1910-'11, A. L. Dacy, then Assistant Horticulturist of the Experiment Station, undertook to demonstrate the practicability of restoring run down West Virginia orchards to profitable production. Full credit for the success of the work belongs to Mr. Dacy, who supervised the operations in all the orchards, the author of this bulletin being associated with the work only during the past season.

The orchards are fairly well distributed, being located at Letart, Grape Island, Salama, Parkersburg and Terra Alta and represent very well the general run of neglected orchards in the state. In fact some of them represented more difficult propositions than the average. This is especially true of the one at Letart.

The Davis Orchard.

In the fall of 1909, Mr. B. S. Davis purchased a farm at Letart,

Mason County, on which were about 600 apple trees, approximately thirty years old and in a very neglected condition. It had never been sprayed and had been so thoroughly neglected for seventeen years that the trees were nearly obscured by the unrestrained growth of Sasafras, Locust and Hickory (fig. 5). During the winter following the purchase of the farm, Mr. Davis appealed to

FIG. 5.—Seventeen years of neglect. Condition of the Davis orchard before rejuvenation.

the Experiment Station for advice and assistance. It was in response to this appeal that Mr. Dacy undertook to bring order out of chaos by supervising and assisting the work of rejunevation in a veritable wilderness.

The work of cleaning up the old orchard was done by Mr. Davis during the winter time when labor could be secured at a dollar a day. The brush, saplings, and dead trees were first cut and burned, after which the apple trees themselves were pruned, the dead wood taken out, and in some cases, the tops cut back. It did not seem feasible to plow the orchard, so manure and straw were hauled in as a mulch.

Beginning in 1910, the trees have been sprayed three times each year. Bordeaux mixture of the 3-5-50 formula was used the first

year, but in 1911 and 1912 lime-sulphur has been applied. About fifty Nickajack trees where the Bitter Rot has been troublesome, have been sprayed three times in addition to the regular sprayings, during the past two seasons. The orchard is now in a vigorous condition and gives promise of being a heavy producer in the future.

The orchard produced a crop the first season, 1910, of 500 barrels which were sold on the trees for $400, a price far below their real worth. Practically no crop was produced in 1911, but in 1912 the orchard yielded 833 barrels of firsts and seconds which sold for a total of $1431.75. This does not include a considerable amount of summer fruit sold locally, of which no record has been made.

Financial Statement.

Cost of cleaning up land	$100.00	
Manure and straw applied, 200 loads @ $0.75	150.00	
Cost of spraying to date	80.00	
Cost of picking and hauling 833 barrels	150.00	
Cost of 833 bbls. @ $0.37	308.21	
Total expense	$788.21	
Cash from sale of fruit 1910		$ 400.00
Cash from sale of fruit 1912		1,431.75
Total		$ 1,831.75
Net profit for first three years		$ 1,043.54

The Stone Orchard.

In the spring of 1910, Spencer Stone's orchard of 738 Rome trees, 22 years old, located at Vienna four miles from Parkersburg, was taken under the advisary control of the Horticultural Department. The orchard was in a fair state of health, but had not been a good producer. In 1905 it received the only spraying it ever received, and that year produced its largest crop, 225 barrels.

Mr. Stone, acting on advice from this department, gave the orchard a good pruning, and put it under thorough cultivation. The Station did some experimental spraying in a part of the orchard and Mr. Stone sprayed the remainder. The careful performance of this work was quickly and liberally rewarded with a crop the first season. A severe freeze and cold wind on May 7th killed the blossoms on about half the orchard which had a southwestern exposure, but the other half with a northeastern exposure set fruit and produced 488 barrels. A good cover crop of cowpeas was also grown and plowed under the following spring. The spraying, cultivation and pruning were carefully looked after in 1911 and a yield of 2208 barrels was secured. After two such crops as this the 1912

crop was light as might be expected. Only 25 barrels of No. 1 fruit and 75 barrels of drops were secured this year. The orchard is now in its prime and will undoubtedly continue to produce as long as given good care.

Financial Statement.—1909.

Pruning	$ 50.00	
Fertilizer	30.00	
Plowing and cultivation (estimated)	75.00	
Spraying (estimated)	200.00	
Cover crop	50.00	
Picking and marketing 488 barrels	125.00	
Total cost	$530.00	
Cash for 488 bbls.		$ 1,150.00
Net profit in 1910		620.00

1911.

Cultivation	$ 36.00	
Spraying	270.00	
Picking and packing 2208 Bbls.	662.40	
Hauling at .05 per bbl.	110.40	
Cost 2077 bbls. @ .36½	758.00	
Total cost	$1,836.80	
Cash for 1639 bbls. No. 1 @ $2.50		$4,097.50
Cash for 438 bbls. No. 2 @ $1.75		766.50
Cash for 131 bbls. ungraded @ $2.000 net		262.00
Cash for culls and drops		400.00
Total gross income		$5,526.00
Net profit in 1911		$3,679.20

1912.

Cultivation	$ 25.00	
Cowpeas for cover crop	15.00	
Mowing clover for mulch	2.00	
Manure	10.00	
Spray material	48.30	
Spraying	119.00	
Total cost	$219.30	
25 barrels No. 1 apples		$ 50.00
Drops		75.00
Gross income		$125.00
Net loss in 1912	$ 94.30	
Total expense for 3 years	$ 2,586.10	
Total income for three years		$6,801.00
Net profit for 3 years		$4,214.90

The Bartlett Orchard.

In 1910 the orchard belonging then to Dr. Charles H. Bartlett situated at Salama, Pleasants County, was taken under the supervision of the Experiment Station. The orchard consisted of 500

trees, nineteen years of age. It had been given good attention for the first half of its existence, but had been utterly neglected for nine years.

When examined by Mr. Dacy it was found to be so grown up with locust and sumac that the trees were nearly hidden. The orchard had never produced a profitable crop, its largest one having sold for $17 and the 1909 crop for $2.00. The trees were making almost no growth but were fairly free from disease.

The plan of operation in the orchard was much the same as in the Davis orchard. The brush, briars, and saplings were first removed, the trees pruned and then a thorough spraying campaign inaugurated. Bordeaux mixture was used three times in 1910 and lime-sulphur solution three times each year since. No fertilizer has been applied in this orchard although it might have been benefited by an application. The trees are now in a very vigorous condition and are making a strong annual growth.

The crop in 1910 was sold for $55 on the trees. This proved to be an unfortunate sale, as 100 barrels of fine fruit were harvested worth at least $150. The crop of that year would have been much larger had it not been badly injured by a severe freeze on May 6th. The 1911 crop was much better, yielding 564 barrels, besides one hundred bushels of seconds and drops, while in 1912 a moderate crop has been harvested.

Financial Statement.

1910.		
Cleaning out brush, etc.	$ 81.25	
Pruning	18.75	
Spraying materials	78.56	
Two inch iron pipe	2.15	
Labor	6.00	
Depreciation on spray outfit	28.00	
Total cost	$215.71	
Cash from sale of fruit		$ 55.00
Deficit at end of first year	$160.71	
1911.		
Spray material	$ 45.66	
Iron pipe	30.97	
Pruning	15.00	
Depreciation on spray outfit	25.20	
Total expense	$116.83	
Cash from sale of fruit		$705.00
Drops and seconds		30.00
		$735.00
Net profit on second year's work		$618.17

1912.

Spray material	$ 37.75	
Pruning	24.75	
Cutting undergrowth	24.50	
Spraying	18.00	
Depreciation on spray outfit	22.68	
Total expense	$127.68	
Cash for 173 barrels @ $1.00		$173.00
Cash for 122 barrels @ $0.90		109.80
Gross income for 1912		$282.80
Net profit for 1912		$155.12
Total expense for 3 years	$459.22	
Total gross income for 3 years		$1,072.80
Net profit for three years		$613.58

The Reynolds Orchard.

The Reynolds orchard, situated about one and one half miles from St. Marys consists of 850 twenty year old Rome Beauty trees (figs. 6 and 7). When taken under the supervision of the station in the spring of 1911, the orchard was in a badly run down condition. Unlike the Davis and Bartlett orchards, it was not grown up

FIG. 6.—Reynolds Orchard after rejuvenation, Figure 7 shows the other half of orchard.

to brush, but a heavy sod, coupled with a lack of care were rapidly sapping the vitality from the trees. They were making only an inch or less of growth, the limbs were dying back, the foliage was thin and sickly and the production had fallen to practically nothing. In fact it was on the verge of actual starvation.

Fortunately the orchard was comparatively free from disease and insects. The first year the trees were given a much needed pruning, removing the dead wood and thinning out the dense growth.

As soon as the ground could be worked, plows were put in the orchard and the sod broken up. The plows were followed with harrows and the soil kept well worked until the last of July. In this way the moisture was so well conserved that the foliage remained green and luxuriant until late in the fall, although the season was one of the driest known in that section for years. After the last cultivation a crop of cowpeas was planted to act as a cover crop. A fine stand was secured making a thick mulch which was plowed under the following spring.

In the spring of 1911 the entire orchard was covered with commercial fertilizer, analyzing 3 per cent Nitrogen, 8 per cent Phosphoric Acid and 10 per cent Potash, at the rate of 500 pounds per acre. The following spring, 1912, the entire orchard was covered again with fertilizer at the rate of 400 pounds per acre. The analysis was changed a little and 3-10-8 goods were used as it was thought the additional phosphorus would be beneficial. The orchard has been sprayed both seasons with lime-sulphur, using arsenate of lead as a poison.

The results of these treatments were soon apparent. The first season only a small yield was secured—60 barrels—but many fruit buds were formed and the general appearance of the trees was vastly improved. The second season 1,350 barrels of splendid fruit were produced, the trees made a good growth, the foliage was heavy and a good supply of fruit buds were formed.

FIG. 7.—Reynolds orchard after rejuvenation. Figure 6 shows the other half of orchard.

Financial Statement.
1911.

Pruning	$167.50
Fertilizer	113.50
Plowing	30.00
Cultivation	24.00

Applying fertilizer	15.00	
Hauling fruit to depot	3.00	
Picking apples	16.05	
Cowpeas for cover crop	34.50	
Spray material	36.00	
Spraying four times	120.00	
Pruning tools	20.00	
Depreciation on spray outfit	50.00	
Total expense	$629.55	
65 barrels apples @ $1.50		$ 97.50
Loss on year's operations	$532.05	

1912.

Fertilizer	63.47	
Spray material	68.00	
Plowing	42.00	
Cultivation	24.00	
Sowing cowpeas	15.00	
Cow pea seed	28.00	
Expense for spraying	90.00	
Depreciation on spray outfit	40.00	
1350 barrels	540.00	
Harvesting apples	274.00	
Total expense	$1,184.47	
1350 barrels @ $2.00		$2,700.00
Drops		80.00
Gross income 1912		2,780.00
Net profit 1912		1,595.53
Total expense for 2 years	$ 1,814.02	
Total income for 2 years		$ 2,877.50
Net profit for 2 years		$ 1,063.48

The Lowther Orchard.

In the spring of 1911 renovation work of a different character was attempted in the orchard of Mr. M. R. Lowther, situated about four miles north of Parkersburg at Vienna. The orchard consists of 115 trees at least fifty years old. The orchard had been in sod and pastured for many years and had been very generally neglected. In 1909 the orchard had been atrociously pruned as may be seen from the illustration on the cover page of this bulletin. Large lower limbs were carelessly removed leaving bad stubs and the bearing surface reared high in the air. The crops secured from the orchard had been very small and of little value.

Under the supervision of the Horticultural Department, the work of rejuvenating this orchard was begun. First the trees were pruned, the tops thinned out and headed back and *the old stubs left by the previous pruner were cut off*. The ground was plowed and planted to potatoes. The potatoes were supposed to have been heav-

ily fertilized, but owing to a misunderstanding this fertilizer was not applied. The orchard made a good growth and threw out many new branches just below the cuts on the limbs that had been headed back. In the spring of 1912 these branches were thinned out and headed back somewhat to keep the new head as low as possible. Three sprayings were applied both in 1911 and 1912.

Large yields could not be expected the first two years from the depleted tops. From the bearing limbs that were left, however, 140 barrels of fruit were taken in 1911 and in 1912 the crop was sold on the trees for $150.00.

FIG. 8.—Crane orchard before rejuvenation. These neglected trees are too brushy but are sound and uninjured by previous vicious pruning. Compare with figure 1.

Financial Statement.

1911.

Labor pruning 71 hours @ .15	$ 41.65	
Spraying	30.50	
*Total expense	$ 72.15	
Net cash for 140 barrels		$245.00
Net profit		172.85

*Expense of cultivation may be charged to potatoes in 1911 and to cowpeas in 1912.

1912.		
Spraying and pruning	36.70	
Sale of fruit on trees		$150.00
Net profits		113.25
Total expense for 2 years	$108.90	
Gross income for 2 years		395.00
Net income for 2 years		286.10

The Crane Orchard.

An old orchard of 160 trees shown in figures 8 and 9, and owned by Mr. Dee Crane of Terra Alta, has been given some attention by this department for the past three years. The first year it was pruned, the rough bark scraped from the trunks and limbs and thoroughly sprayed with lime-sulphur solution, using arsenate of

FIG. 9.—Crane orchard after rejuvenation. The tree in the foreground illustrates proper pruning.

lead as a poison. The processes with the exception of the scraping have been repeated each year. No fertilizer has been added. The orchard yielded practically nothing of any value before it was thus partially renovated, but has produced in the years 1910, 1911 and 1912, 250 bushels, 400 bushels and 500 bushels respectively. This has sold uniformly at $0.50 per bushel.

Financial Statement.

1910.

Pruning and scraping	$ 20.00	
Spraying	10.00	
Depreciation of spray outfit	4.00	
Picking and marketing	25.00	
Total expense	$ 59.00	
250 bu. apples @ $0.50		$125.00
Net income in 1910		$ 66.00

1911.

Pruning and Spraying	$ 15.00	
Picking and Marketing	35.00	
Depreciation of Spray outfit	3.60	
Total expense	$ 53.60	
400 bu. apples @ $.50		$200.00
Net income 1911		$146.40

1912.

Pruning and Spraying	$ 15.00	
Picking and marketing	40.00	
Depreciation of Spray outfit	3.20	
Total expense	$ 58.20	
500 bu. apples @ $.50		250.00
Net income 1912		$191.80
Total expenses for 3 years	$170.80	
Total gross income for 3 years		$575.00
Net profit for 3 years		$404.20

SUMMARY OF RESULTS.

Name of Orchard.	*No. of trees.*	*No. years Records*	*Gross Income*	*Net Income.*
Davis	600	3	$ 1,831.75	$ 1,043.54
Stone	738	3	6,801.00	4,214.90
Bartlett	500	3	1,072.80	613.58
Crane	160	3	575.00	404.20
Reynolds	850	2	2,877.50	1,063.48
Lowther	115	2	395.00	286.10
	2,963		$13,553.05	$ 7,625.80

	Income. Gross	*Income. Net*
Average annual income per tree for the state	$ .54	$
Averave annual income for the six rejuvenated orchards	1.71	.93
Highest average annual income per tree for the six orchards	3.07	1.90
Lowest average annual income per tree for the six orchards	.72	.41

From the summary it will be seen that the operations have been attended with success as far as the financial part has been concerned. Not one of these orchards had produced a profitable crop for several years before it was taken hold of by this Station. Several of them

were so badly devitalized by neglect and starvation that they were on the actual verge of destruction. That some of the weakest of them failed to return a profit on the first year's operations is not to be wondered at, but let it be noted that *by the second season in every case, a crop had been secured that more than paid all expenses.*

No data is available whereby the average net income per tree for the entire state may be estimated, but it would seem that thirty cents would be a fair figure. The trees in the six rejunevated orchards have been raised immediately from no income at all to over three times the average for the state. Even in the least productive of the six the gross income is about 1½ times the state's average and in the best yielding orchard it is nearly six times as large.

Approximately one half the apple trees in West Virginia are in need of rejuvenation in one form or another. Any farmer of average intelligence can by following out the general directions given in the first half of the bulletin, place his orchard on a paying basis. The initial expense is slight and the profits are reasonably certain and prompt.

If rejuvenation could be started at once in every neglected orchard in the state that is not already beyond repair, the crop would be doubled in two years and from two and one-half to three and one-half million dollars would be added to the annual income of the farmers of the state.